



RDS Spy

Freeware RDS Decoder for Windows with Plugin Support

Version 0.94

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Installation

1. Download the application zip file.
2. Create new folder on your hard disk, for example D:\rdsspy\
3. Unzip the content to the new folder.
4. Enter the folder and run the rdsspy.exe
5. Select the RDS data source.
6. You are done!

These files are necessary to run the application:

rdsspy.exe
fmio.dll
datxchg.dll

Minimum Requirements

- Pentium 166 MHz
- 32 MB RAM
- Screen resolution 800x600 @ 256 colors
- Windows 98

Some plugins may have individual hardware and software requirements.

RDS Data Sources

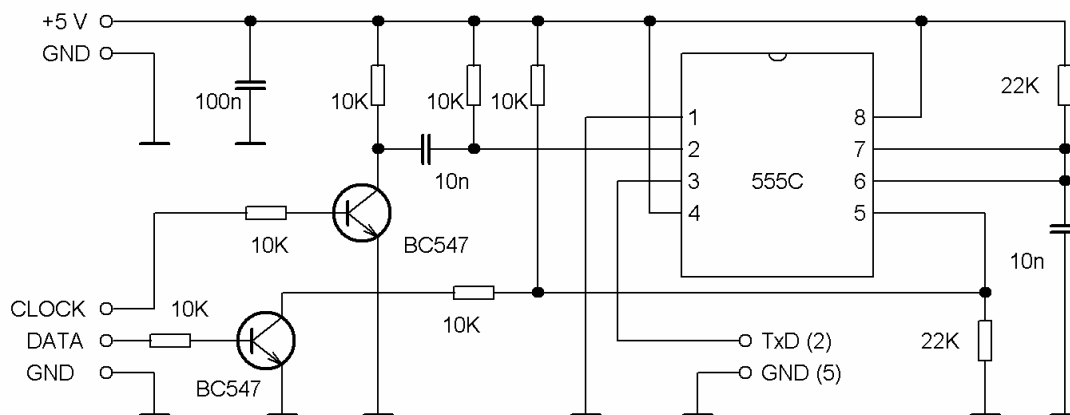
Several RDS data sources are provided for live RDS decoding:

- Serial COM Port – Data and Clock signals must be converted using a simple circuit. This ensures compatibility with all RS232 ports and USB to RS232 adapters.
- Sound card – Data and Clock – Data and Clock signals are fed to your sound card line-in stereo input.
- Sound card – RDS Encoder – For RDS encoder output data analysis. The RDS encoder output is fed to the sound card through a simple half-wave rectifier circuit.
- P75/P175 FM Analyzer – Measuring device connected either via RS232/USB or Ethernet.
- (No source) – The software provides offline playback feature only.

Serial COM Port

Old DOS-based RDS decoders use special pins of the RS232 port to feed the Clock and Data signals to the PC. Today this solution has a few big disadvantages like compatibility problems with USB adapters, higher CPU load or gaps in RDS reception when the PC is busy.

Following simple circuit converts the Clock and Data signals to valid ASCII characters on its TxD output. These are received by the PC via RxD pin of the COM port as any other standard serial communication.



Pin configuration – RDS demodulators

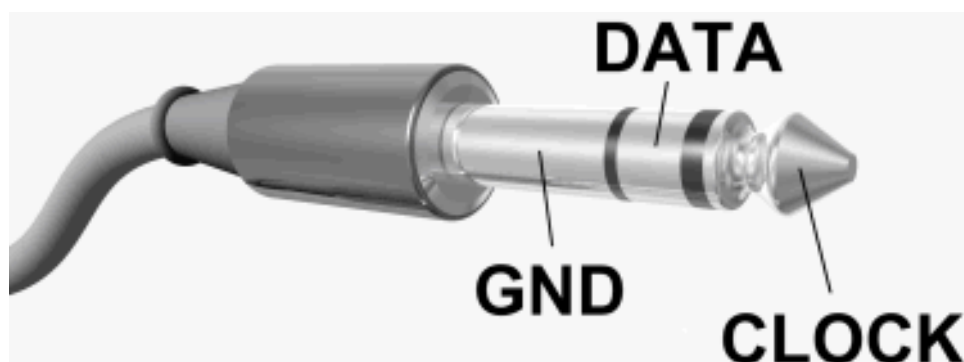
	Clock	Data	Ground	+5V
TDA7330	12	13	5	16
SAA6579T	16	2	11	12
SDA1000	10	11	1	
SAA7579T	9	10	8	
BU1922	16	2	11	12

Pin configuration – Serial COM port of the PC

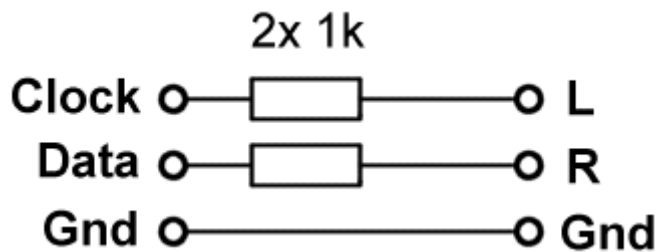
	9-pin	25-pin
RxD	2	3
Ground	5	7

Sound card – Data and Clock

If the PC is not equipped with any RS232 port or if you do not want to solder the converter above, you can simply plug the Data and Clock signals to the sound card. The application ensures excellent compatibility with almost any sound card using software defined PLL, numerically controlled oscillator (NCO) and edge detector.



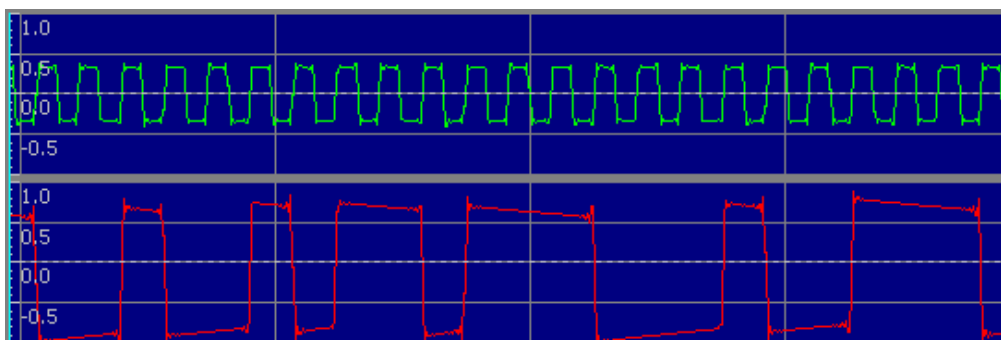
It's recommended to insert 1k resistor to each the Data and Clock signal path rather than connect them directly. This may help to suppress RF interference caused by digital signal edges and protects your sound card. Do not use longer cable than it's required for the connection.



In the audio device control select Recording properties and then select the sound card input the cable is connected to. This is usually marked as Line-in.

If you hear the data from the speakers, switch off the Line-in in the Playback options.

In case of any troubles run any WAV editor, record a few seconds of the data and check how the signal looks like. You should see something like this:



Eventual clipping has no effect on right functioning. Close any other application accessing the sound card input before running the RDS Spy. The application uses these sound card settings:

Sample rate	11025 Hz
Resolution	16bit
Mode	Stereo

The sound card source permits the user to select if data are valid at rising or falling edge of the clock signal. Please remember that this option has **no effect** if you use RDS demodulator based on TDA7330, SAA6579 or similar. Which clock transition (positive or negative going clock) the data change occurs in, depends on the lock conditions and it's arbitrary.

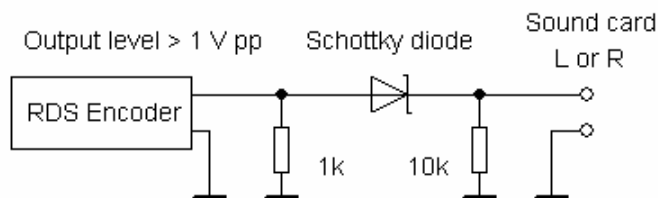
In special cases the input signal may require polarity inversion. This may occur for example when using optocouplers or specific sound card. For this purpose the Invert option is provided.

Please note that your PC is unable to decode RDS directly from the demodulated audio signal. There always must be an RDS demodulator present inside the receiver or connected externally that provides the Clock and Data signals required.

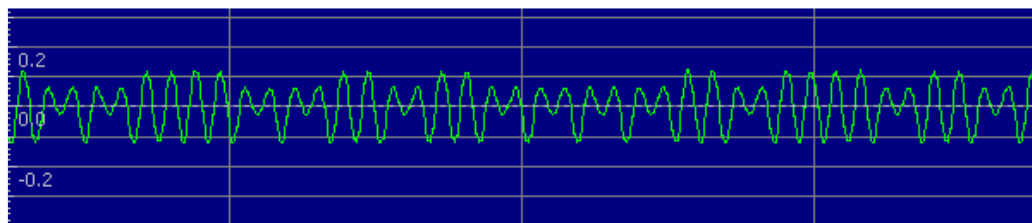
Sound card – RDS Encoder

RDS Encoder is a device that puts the RDS signal on-air on the transmitter site. The RDS Spy allows analyzing the RDS data and adjusting all RDS services before final installation of the encoder.

The 57 kHz subcarrier generated by the RDS encoder cannot be directly processed by most of sound cards. However a simple half-wave rectifier can provide this possibility and gives a way how to analyze the data from the RDS encoder output without need of any RDS demodulator:



The signal processed by this circuit should look like this:



The application uses these sound card settings:

Sample rate	22050 Hz
Resolution	16bit
Mode	Mono

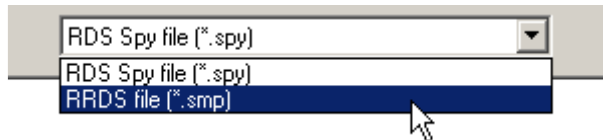
Notes:

- Suitable Schottky diodes are: 1N5711, 1N6263, BAT41-BAT48, BAT85S, etc. Almost any type will apply.
- If MIC input is used instead of Line-in, a separation capacitor may be required due to DC voltage on the MIC input (used as the microphone power supply). In this case connect the circuit output through a 10 μ F capacitor.
- Unplug pilot tone or MPX signal from the encoder before use or make sure this signal is not internally fed to the encoder output.

Recording and Playing RDS Files

File Types

The RDS Spy supports two types of RDS files for recording and playback: RDS Spy files (*.spy) and RRDS files (*.smp). The user may decide for any of them.



Following table summarizes the file type characteristics:

	RDS Spy files (*.spy)	RRDS files (*.smp)
Data representation	ASCII	Binary
File size (1 minute)	14 kB / 31 kB	11 kB
Stores checkwords	No	Yes
Benefits	<ul style="list-style-type: none">• Simply viewable and editable• May include time information for each RDS group• May include additional information	<ul style="list-style-type: none">• Ensuring compatibility with older and still great DOS software RRDS and RDSS

Recording

Before recording a RDS file check the Recording folder and file name in Options. You may also assign the file name manually before each new recording by pressing the button with three dots next to the REC button. In this case the file name will appear on the LCD.

Start recording by pressing the REC button.

Playback

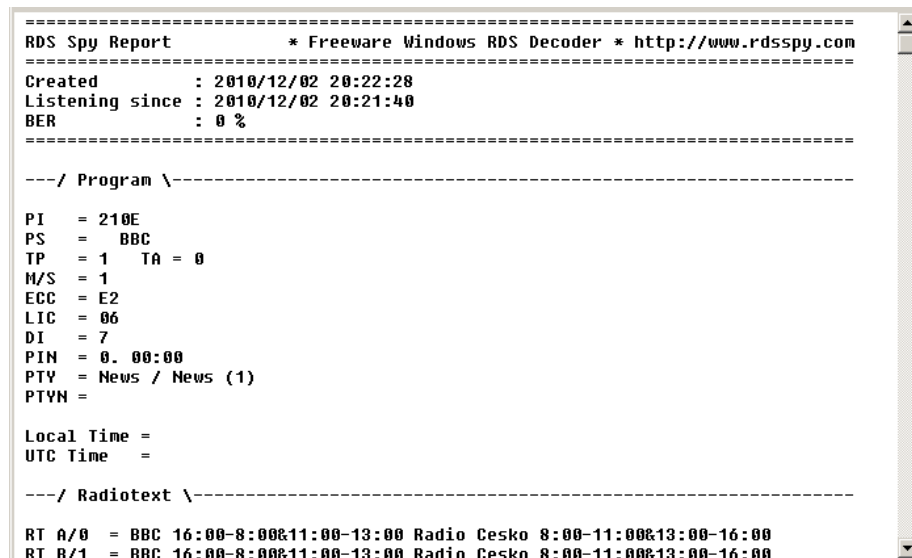
To play the RDS file choose menu item File / Play File or click on the PLAY button or simply move the file from the Total Commander or similar file manager to the RDS Spy main window.

During the playback you may adjust the playback speed or pause the playback using the track bar on the left.

After the file reaches its end, you may return to live decoding by pressing the Reset button.

Creating Reports

The user may create the report either manually or leave the application to save reports automatically.



```
=====
RDS Spy Report          * Freeware Windows RDS Decoder * http://www.rdsspy.com
=====
Created       : 2010/12/02 20:22:28
Listening since : 2010/12/02 20:21:40
BER           : 0 %
=====

---/ Program \-----
PI   = 210E
PS   = BBC
TP   = 1   TA = 0
M/S  = 1
ECC  = E2
LIC  = 06
DI   = 7
PIN  = 0. 00:00
PTY  = News / News (1)
PTYN =

Local Time =
UTC Time   =

---/ Radiotext \-----
RT A/0 = BBC 16:00-8:00&11:00-13:00 Radio Cesko 8:00-11:00&13:00-16:00
RT B/1 = BBC 16:00-8:00&11:00-13:00 Radio Cesko 8:00-11:00&13:00-16:00
```

To create the report manually, select the option File / Create Report in the main menu.

The application allows to create reports automatically if you enable this feature in Configure / Options / Reports. This is especially useful for logging occasional FM station reception. Note that the folder specified in the report options must be created before. The report is created before any data reset, for example before PI reset, timeout reset, application exit etc.

Please note that some fields in the report may stay empty if appropriate plugin is not installed.

The user may customize the report content by editing the file rdsspy.srt template in any plain text editor such as Notepad. All dynamic tags are delimited by % in the template. These tags are replaced by appropriate value in the report.

For example a template line

TA: %TA%

is replaced by

TA: 1

in the report.

To get the list of all dynamic tags, use the menu item View / Decoder Data or open the default template supplied with the application.

Plugin Administration

Plugins are located in the folder named plugins. For example, if the main application is installed to D:\rdsspy\, the plugins are placed in D:\rdsspy\plugins\. Any plugin placed in this folder is automatically active. To deactivate the plugin, delete it from this folder or move it to another folder.

The application searches for installed plugins at start-up. You can show/hide the plugin using the menu item View. You can configure the plugin using the menu item Configure.

Special Options

Super PI Detector

Enabling this option the RDS Spy will try to get PI code using extremely sensitive statistics methods and continuous integration over a few seconds of the time. Once the synchronization is found, the super PI detector is automatically deactivated.

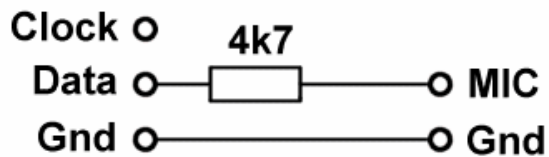
The super PI detector is unique in the fact that it can read the PI code although there are no correct blocks in the data being received. It does not require group and block synchronization at all. However it is not a miracle. It gives best results on stable weak signals which start to be noisy on mono listening. Note that it may give a spurious PI occasionally which is usually simple to recognize and it's replaced by the right PI after a moment.

The output from the super PI detector is not used for PI reset or reports. It can be read on the LCD only. After tuning to a new station the user must click on Reset button to re-activate the super PI detector.

Frequently Asked Questions

Q: I can't find Line-in input on my notebook. There's MIC input only which is mono. Can I decode RDS using this hardware?

A: Yes, you can still decode RDS using the sound card if its sample rate frequency is accurate enough. Due to software defined PLL the application is able to synchronize also using the edges of the Data signal in the Clock channel. Try this connection:



In the sound card configuration switch off all "features" like MIC boost, 20 dB gain, echo cancellation, compressor etc. Some sound cards may require separation capacitor due to high DC voltage on the MIC input (used as the microphone power supply). In this case place a 10 μ F capacitor in series with the resistor.

Q: I'm getting PI although the receiver is switched off or the station tuned does not use RDS. How is that possible?

A: Nothing doing. This is a characteristic of the RDS system combined with high PI detection sensitivity. From time to time the PI (valid block 1) can be found repeatedly in almost any signal. The probability is extremely low in random signal (typically noisy reception). However it's more frequent in signals that do not contain any RDS information but also are not really random. It can be noted that specific combinations of equipment and conditions generate repeatedly the same spurious PI codes.

Support

The software is provided as is, without warranty of any kind. Please send us your suggestions or bug reports, it will help us to improve the software.

Website: <http://www.rdsspy.com>

Email: info@rdsspy.com

Annexes

Serial Protocol Specification

This section explains how to feed the RDS Spy directly from a customized device. For a device equipped with USB or RS232 interface it is better to use this interface also as the RDS data output rather than connecting it to the sound card. The RDS Spy is able to read data that are provided via serial port (implemented in hardware or realized by USB driver, virtual COM port etc.). The software accepts two different protocols via serial port. The first is the one with Clock and Data converter, let's call it Bit protocol. The second is the P75/P175 protocol.

Bit protocol

Using this protocol all RDS data bits from RDS demodulator are translated into serial data bytes. These bytes are sent using 19200 Bd, no parity, 1 stop bit.

Bit value	Byte value
0	0xF0
1	0xFE

Thus one bit of the original RDS data occupies one byte in the serial data. The RDS Spy performs all data processing like block and group synchronization or CRC checking.

P75/P175 protocol

The device must perform all data processing like block and group synchronization and CRC checking. It sends the groups in ASCII representation in this form:

"G: "+#13+#10+"AAAABBBBCCCCDDDD"+#13+#10+#13+#10

where AAAA is PI, BBBB is block 2 etc. No CRC or offsets are included. Bad blocks must be recognized in the device and replaced by ----. For example:

G:
AAAABBBB----DDDD

G:
AAAA-----

etc.

Completely bad groups can be simply omitted. There's no need to send the groups continuously. The data are sent on 19200 Bd, no parity, 1 stop bit or via TCP/IP sockets.

A special group `RESET-----` will have the same effect as clicking on the Reset button in the application.

In addition the RDS Spy sends initialization commands on start-up: `*D*R?F`

Especially the command `*R` can be used by the device to activate the RDS group sending. If this is not required, the initialization commands should be ignored.

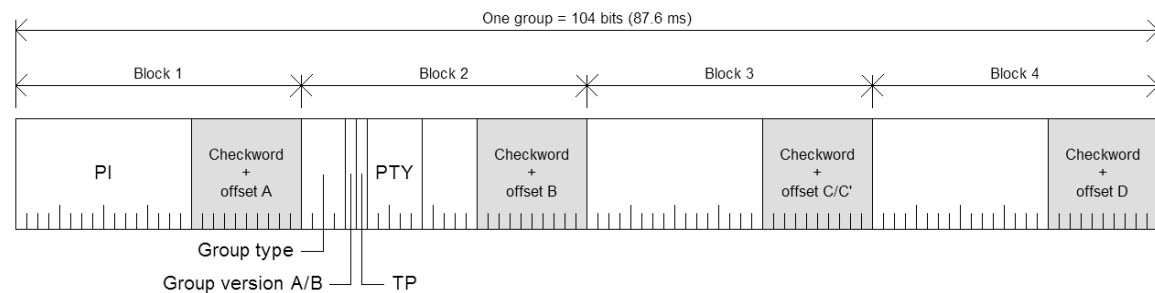
RDS/RBDS Group Format

Following information is provided for better understanding to the RDS principles and the user defined group coding.

The largest element in the RDS coding structure is called a "group" consisting of 104 bits. The group comprises 4 blocks of 26 bits each. Each block comprises an information word and a checksum. Each information word comprises 16 bits. Each checksum comprises 10 bits.

All information words, checksums, binary numbers or binary address values have their most significant bit (MSB) transmitted first.

The data transmission is fully synchronous and there are no gaps between the groups or blocks. The basic data-rate of the system is 1187.5 bit/s. Thus transmission of one group takes about 87.6 ms and about 11.4 groups are transmitted per one second.



General RDS group format.

Basic principles and rules

- The services which are to be repeated most frequently, and for which a short acquisition time is required (PI, TP, PTY), in general occupy the same fixed positions within every group.
- There is no fixed rhythm of repetition of the various types of group, i.e. there is ample flexibility to interleave the various kinds of message to suit the needs of the users at any given time.
- The first four bits of the second block of every group are allocated to a four-bit code which specifies the application of the group - group type. Groups are referred to as types 0 to 15.

- For each type (0 to 15) two "versions" can be defined. The "version" is specified by the fifth bit of block 2: 0 = version A, 1 = version B.
- For all groups of version B the PI is inserted also in block 3 so this block cannot carry any other information when version B of the group is used.

Group types

Group type	Binary coding	RDS services
0A	00000	TA, MS, DI, AF, PS
0B	00001	TA, MS, DI, PS
1A	00010	ECC, LIC, PIN
1B	00011	PIN
2A	00100	RT
2B	00101	RT
3A	00110	AID for ODA
3B	00111	ODA
4A	01000	CT
4B	01001	ODA
5A	01010	TDC or ODA
5B	01011	TDC or ODA
6A	01100	IH or ODA
6B	01101	IH or ODA
7A	01110	RP or ODA
7B	01111	ODA
8A	10000	TMC or ODA
8B	10001	ODA
9A	10010	EWS or ODA
9B	10011	ODA
10A	10100	PTYN
10B	10101	ODA
11A	10110	ODA
11B	10111	ODA
12A	11000	ODA
12B	11001	ODA
13A	11010	ERP or ODA
13B	11011	ODA
14A	11100	EON
14B	11101	EON
15A	11110	(not defined)
15B	11111	TA, MS, DI